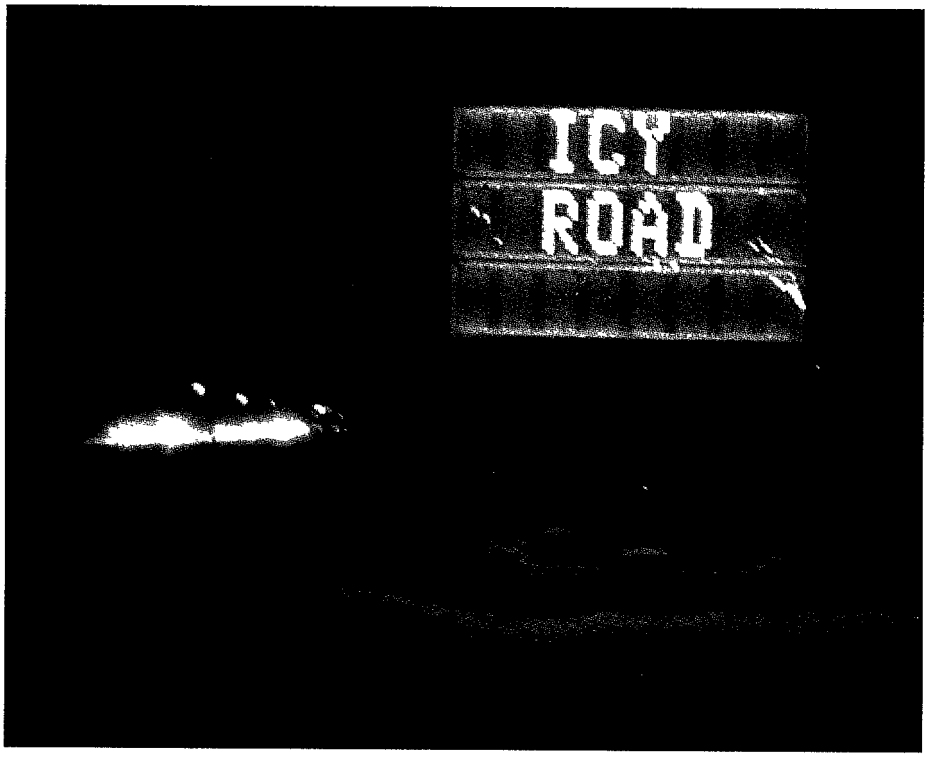
United States Department of Transportation
Federal Highway Administration
Federal Transit Administration

Technology in Rural Transportation "Simple Solution"' #1

ENTERPRISE

Traveler Warnings for Spot Hazardous Conditions



Introduction

This application was identified as a promising rural Intelligent Transportation Systems (ITS) solution under a project sponsored by the Federal Highway Administration (FHWA) and the ENTERPRISE program. This summary describes the solution as well as opportunities for expansion into the broader context of rural ITS.

Technology Overview

Ice tends to form on bridges and overpasses before it does on other portions of the roadway. Given that the main roadway may not be icy, drivers often do not anticipate icy conditions on bridges, etc., and are therefore not prepared. This simple solution equips those sites most susceptible to icing with detectors connected locally to a device that warns drivers to slow down and use caution on the icy surface.

Real-World Example - **Washington State Ice on Bridge Warning System**

Overall goal: To increase the safety of drivers on a bridge prone to icy conditions.

Technical approach: Ice sensors were installed on the bridge. When these detected ice on the pavement, flashing beacons were activated on a sign reading "ICE ON BRIDGE WHEN FLASHING".

Current status: The system was intended as an experimental system and was used for a limited period. There were concerns over liability should an accident occur on an occasion when the sensors failed to detect icy conditions.

Location / geographic scope: The system was tested on Highway 101 near Port Angeles on the Olympic Peninsula in Washington State.

Agencies involved: Washington State DOT

Cost information: None available. The technologies used were widely available and low-cost.

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Wave goals been achieved? The technology proved to operate satisfactorily, however, liability concerns may prevent permanent deployment.

Solution timeline: Intended as experimental system only.

Further Description of Application

Additional technologies may include:

Other means of providing traveler warnings include variable message signs, activated by sensors, which could provide more detailed information on conditions. Details on area-wide road or weather conditions could alternatively be communicated to travelers via wireless data broadcast, using AM, FM or HAR subcarriers. Messages could either be provided to travelers using roadside signs or in-vehicle devices, including regular radios. The costs to support this service using radio subcarrier technologies would be prohibitive as a stand-alone service. However, in areas already disseminating data over wireless radio, additional costs to encode and deliver this information would be minimal.

Potential additional uses for this technology may include:

It could be that additional types of potentially hazardous locations, for example, locations prone to flash flooding, high winds, or reduced visibility due to fog, drifting snow or sand could be instrumented with appropriate sensors which could then activate similar stand-alone warning signs or flashing beacons.

Benefits of Application

	Benefits to travelers	Benefits to the community / public sector	Benefits to business / industry
Direct benefits	Increase in driving safety	Increase in local roadway safety vehicles	Increase in safety of freight
Indirect benefits	Less costs incurred in repairs or insurance through avoiding accidents	Less costs incurred in making repairs to accident locations Favorable public perceptions of safety improvement schemes	Less costs incurred in repairs, insurance, and loss of shipments through avoiding accidents

Probable Implementation Process

Step One: Cities or counties should first consider whether the nature of conditions in their jurisdiction warrant such warning systems. As is outlined above, this configuration of sensor and flashing beacons / message sign could be utilized for a number of different conditions, and it is possible that at least one of these types of condition could be experienced in any part of the continent, indicating widespread potential applicability for such warning systems.

Step Two: Accident records should then be investigated to identify which bridges, routes, or other appropriate locations would benefit most from the installation of warning systems. Criteria which could affect the appropriateness of a warning system at a given location could include: the frequency and severity of crashes, the frequency and severity of dangerous conditions, the traffic levels on the affected route, and the number of unfamiliar travelers who use the affected route.

Step Three: The appropriate combinations of sensors and warning signs / beacons should then be specified and procured.

Step Four: Warning systems must be installed and reliability evaluations performed to ascertain that systems are functioning adequately prior to being fully commissioned. Given the liability concerns expressed by the implementers of the Washington State Highway 101 system, it could be advisable to incorporate some type of status logging capability into the system such that data on the performance of the components is available for periodic analyses.

Potential Implementation Issues

The issue of liability which was identified by the original implementers of this technology requires careful consideration. There were concerns over liability should an accident occur on an occasion when the sensors failed to detect icy conditions or if the sensors detected icy conditions but a beacon malfunction prevented activation of the warning. For a simple, stand-alone system, the reporting of malfunctions to a central point for action would severely impact the cost benefits of the application. One potential approach would be to implement systems as part of a wider regional or corridor infrastructure. For this type of configuration, it is more likely that two-way communications with the responsible agency would be more cost-effective. The

communications system could be used to report malfunctions to the agency and for the agency to override the system if required.

It may be that the greater investment needed to install such a regional or corridor system would make agencies more likely to consider transferability and expandability issues related to the technology.

Solution's Contribution to Broader Rural ITS Developments

This simple solution is a prime example of a site-specific, stand-alone application of technology, given that it provides warnings of localized conditions which need only be communicated to local travelers who are likely to encounter an occasion of a recurring condition. The potential role of this solution in an integrated rural intelligent transportation system is described below:

Traveler Information - Linking the site-specific application to a regional or corridor infrastructure allows this solution to serve as part of a regional traveler information system, providing real-time information to travelers at isolated locations.

Incident Management - The occurrence of spot hazardous conditions, such as roadway icing and reduced visibility, is often described as an incident. Equipped sites are locations where incidents are likely to occur, hence this solution helps to manage the vehicles in and around the incident site, especially if additional technologies for incident management, such as closed circuit television (CCTV) cameras, are also installed at the affected location.

The Technology in Rural Transportation: "Simple Solutions" Project

This project was performed within the ENTERPRISE pooled-fund study program, and aimed to identify and describe proven, cost-effective, "low-tech" solutions for rural transportation-related problems or needs. "Simple solutions" studied within the project focussed on practical applications of technologies, which could serve as precursors to future applications of more advanced systems, or intelligent transportation systems (ITS).

More than fifty solutions were initially identified and documented. Of these, fourteen solutions were documented and analyzed in detail. The transportation technology applications were also categorized according to the seven Critical Program Areas (CPAs) defined within the U.S. Department of Transportation's Advanced Rural Transportation Systems Program. It is hoped to utilize the information gathered within this study to perform outreach to local level transportation professionals to introduce them to ITS and its potential benefits.

For More Information: A full report on this study is available from the FHWA R&T Report Center, telephone no. **301-577-08 18. Title:** Technology in Rural Transportation: "Simple Solutions." **Publication** No.: FHWA-RD-97- 108. This research was conducted by Castle Rock Consultants, Eagan, Minnesota. For more information, contact Paul Pisano of FHWA, HSR-30, 703-285-2498. For more information about ENTERPRISE, contact Bill Legg, Washington State DOT, 206-543-3332.

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